



Fishing for Answers

Understanding Missouri's aquatic ecosystems helps us enjoy, appreciate and conserve our precious aquatic resources.

Estimated Time

Two or three 50-minute class sessions

Technology Tools/Skills Used in Chapter

Fishing skills

Safety Precautions/Concerns

Use extra care when handling rods and reels.

Vocabulary

Angler
Ethics
Sport fisherman

Chapter Objectives

Students will be able to:

1. Apply knowledge of species adaptations in the conservation of Missouri's aquatic resources.
2. Apply knowledge of factors that affect the number and types of organisms an environment can support and how populations of organisms within a community compete with one another for resources in the conservation of Missouri's aquatic resources.
3. Apply knowledge of the roles producers, consumers and decomposers in the transfer of energy in an aquatic food web in Missouri.
4. Apply knowledge of how changes in the number or type of organisms in an aquatic community in Missouri might affect populations of other organisms within that community in the conservation of Missouri's aquatic resources.
5. Demonstrate ethical judgment with regard to the conservation of Missouri's aquatic resources.

Targeted Grade-Level Expectations

EC.1.B.6.a.
EC.1.B.6.b.
EC.1.B.6.c.
EC.1.D.6.a.
EC.1.D.6.b.
EC.1.D.6.c.
EC.2.A.6.a.
EC.2.A.6.b.
EC.3.C.6.a.
EC.3.C.6.b.
IS.1.C.6.a.

Reference Material for Teacher Background

- DVD Compilation for *Conserving Missouri's Aquatic Ecosystems*
- Fishing Regulations Summary (E00606)
- Introduction to Fishing (FIS152)
- Introduction to Missouri Fishes (FIS020)
- Kids Fishing Book (E00092)
- Know Missouri's Catfish (FIS003)
- Map: Smallmouth Bass (FIS019)
- Map: Trout Fishing In Missouri (FIS210)
- Poster: Missouri Fishes (E00013)
- Stream Insects/Crustaceans ID (STR250)
- Zebra Mussels: Missouri's Most Unwanted (FIS013)
- *Fishes of Missouri* (01-0031)

Required Materials

- DVD Compilation for *Conserving Missouri's Aquatic Ecosystems*
- Fishing Regulations Summary (E00606)
- Hula-hoops, Backyard Bass or other suitable casting targets (optional)
- Missouri Fishes poster (E00013)
- Notebook paper
- 1 copy of Casting Instructions for each student
- 1 copy of Fishing Instructions for each student
- 1 copy of Summary of Missouri Fishing Regulations booklet for each student
- 1 copy of the Scavenger Hunt for Missouri Fishing Regulations for each student
- Pens or pencils
- Poster: Missouri Fishes (E00013)
- Prizes or rewards (optional)
- Rod-and-reel combinations set up with casting plugs (Advanced preparation is required.)
- Student Guide
- TV/DVD player

Activity 10.1: Exploration of Students' Current Understanding of Fishing, Aquatic Recreation and Conservation

This activity explores students' current understanding of fishing, aquatic recreation and conservation.

Estimated Time

Varies—class time may be provided or reading may be assigned as homework. Allow at least 20 minutes for in-class questions and discussion.

Required Materials

- Poster: Missouri Fishes (E00013)
- 1 copy of Casting Instructions for each student

Procedure

1. Display the Missouri Fishes poster in the classroom. Use a cooperative learning activity to explore the following questions:
 - Have you ever been fishing? If so, tell about the experience. If not, would you like to go?
 - How do people find and catch fish?
 - What are the rules for fishing?
 - What else do people do to enjoy Missouri's aquatic resources? Have you ever done any of those things? If so, tell about the experience. If not, would you like to?
 - What can I do to help conserve Missouri's aquatic ecosystems? Have you ever done any of those things? If so, tell about the experience. If not, would you like to?
2. Explain to the class that this chapter will help them understand how to find and catch fish, follow the rules for fishing and enjoy and conserve Missouri's aquatic ecosystems.
3. Distribute one copy of Casting Instructions for each student.
4. Have students read Casting Instructions—class time may be provided or reading may be assigned as homework in advance of class. Have students keep the instructions in their notebooks for use in Activity 10.2 and the field study day.

1. Casting is a mechanical activity. The fishing rod extends your arm and allows you to “throw” your lure or bait a long distance with little effort. Casting is a matter of timing, not strength. You don’t need to “beef up” to become a good caster. In these directions, left-handers should substitute left for right.
2. Look behind you to make sure that there are no trees or bushes around the area to interfere with your cast and to make sure that no one is standing behind you to get caught by the hook when you are casting.
3. Lightly grip the fishing rod in your right hand. Start with your shoulders square to your target, right elbow near the front of your rib cage, forearm and rod pointing in the direction of the cast. Let out 5 to 10 inches of line from the tip of your rod to the practice plug, bait or lure which, because the rod is motionless, hangs straight down. Look at your target.
4. Push the button of the reel with your thumb and hold it in.
5. Lift your right forearm straight up, keeping the elbow in place or allowing it to rise just a little. The rod will follow backwards. Continue until your hand moves to about the level of your ear.
6. Sweep your forearm forward, again keeping the elbow pretty much in place. When your arm is about halfway back to its original position, let loose the line, by releasing the button. The plug, bait or lure will be propelled forward, pulling line off the reel until it lands.
7. Picture a clock face. Think of your elbow as the hub of the clock and your forearm as the hour hand. Start the cast at 10 o’clock. Bring your forearm slowly but steadily back to 2 o’clock. Sweep the forearm forward back to 10 o’clock, releasing the line somewhere near 11 o’clock.
8. If your lure shoots up in the air and doesn’t go very far, you probably released the line too early. If the lure smacks into the ground in front of you, you released the line too late.
9. Remember that the cast has no sudden or jerky motions. Practice until it becomes smooth and nearly effortless.
10. Accuracy is often more important than distance. Many fish remain near protective cover and will strike only those lures that come into their immediate vicinity. Improve your accuracy by casting to definite targets, even while on the water. Make sure you focus on your target while casting.

Activity 10.2: Student Exploration of Casting Technique

This hands-on activity helps students understand casting technique.

Estimated Time

50 minutes

Required Materials

- Rod-and-reel combinations set up with casting plugs (Advanced preparation is required.)
- Hula-hoops, Backyard Bass or other suitable casting targets (optional)

Procedure

1. Take the class outside to a suitable open area such as a ball field, empty parking lot or open lawn. Alternatively, this activity may be done indoors in a suitably large space with a high ceiling, such as a gymnasium.
2. Set out casting targets, if available.
3. Guide the class through the casting process. Have students refer to the copy of Casting Instructions in their notebooks.
4. Allow students to practice as time allows; they may need to take turns.
5. Give lots of positive reinforcement and guidance as needed.

Activity 10.3: Video Introduction to Fishing Techniques

This activity helps students understand ethical and effective fishing techniques.

Estimated Time

Varies—class time may be provided or reading may be assigned as homework. Allow at least 20 minutes for in-class questions and discussion.

Required Materials

- 1 copy of Fishing Instructions for each student
- DVD Compilation for *Conserving Missouri's Aquatic Ecosystems*
- Missouri Fishes poster (E00013)
- TV/DVD player

Procedure

1. Distribute one copy of Fishing Instructions for each student.
2. Have students read Fishing Instructions—class time may be provided or reading may be assigned as homework in advance of class. Have students keep the instructions in their notebooks for use on the field study day.
3. Show the video clip: “Bass Catch and Release.”
4. As time permits, show one or more of the video clips: “Catch and Release Tips” and “Fish Tips.”
5. Display the Missouri Fishes poster in the classroom.
6. Have students identify species on the poster and describe proper handling techniques for each.
7. Instruct students to add columns for bait, tackle and location caught to fish sampling data table they created in Activity 4.6 for use as part of their field study day.

1. Handle rod carefully at all times.
2. Carry rod with both hands and hold rod tip up. Secure hook in rod guide.
3. Lay rod down to bait hook.
4. Before casting, look behind you and to the side to see that no one is near.
5. Cast your line into the water. When the line has stopped, turn the handle of the reel once or twice to make your line tight.
6. Now wait for a fish to bite.
7. If you are using a bobber and your bobber jiggles, plunges downward or skates across the water, you have a bite. If you are holding your fishing pole, you may feel a tap, a tug or a pull, or the line may go slack.
8. When you suspect a bite, set the hook with a powerful upward snap of the rod.
9. Keep the rod up high, so your arms and the bend of the fishing pole absorb some of the power of the fighting fish.
10. Allow the fish to run, taking line from the reel. Recover line by lifting the rod handle and then lowering the rod tip as you reel in, pumping the fish closer.
11. Repeat this process until the fish is close enough to reach.
12. You can draw fish up the bank with your fishing rod until it is close enough to grab by hand, or by backing slowly away from the water.
13. Don't let fish flop on the ground. They could injure themselves. Don't put fingers in their gills or eyes. Be careful not to hook yourself when you grab the fish.
14. The fins of sunfishes and bass become rigid when the fish is threatened. Slide your hand down over the fins of small fish and hold them firmly. Grasp larger fish over the back of the head, above the gills. Bass, crappie and small catfish can be safely held by putting your thumb into their mouth and pinching their lower lip. For catfish, protect yourself by holding the fish from the underside, with your fingers firmly beneath the pectoral spines. Remember, the barbels are harmless.
15. Immobilize fish by holding them upside down. Remove the hook by hand or with needlenose pliers. If the fish is hooked deeply in the gills or stomach where the hook cannot easily be removed, clip the line as close to the hook as possible. The hook will fall out after a time, with minimal damage to the fish.
16. Measure the fish from the tip of the snout to the end of the tail, with the fish laid flat and the tail lobes pressed together. Weigh and identify the fish quickly and record bait, tackle and location caught data in the data table you made in Activity 4.6.
17. Release fish as soon as possible. The longer the fish remains out of the water, the less its chances of surviving. Stressed fish can often be revived by holding them upright in the water and moving them slowly back and forth until they can swim away under their own power. Fish have a good chance of surviving after being caught many times, if they are handled carefully.
18. If the line becomes snagged, ask for adult help. Carefully pull or cut the snagged line. Jerking the line is dangerous and may result in a hook flying through the air.

Activity 10.4: Student Reading and Research

This activity provides students with definitions and explanations about fishing, aquatic recreation and conservation. It introduces guidelines for ethical conduct in the use of aquatic resources.

Estimated Time

Varies—class time may be provided or reading may be assigned as homework. Allow at least 20 minutes for in-class questions and discussion.

Required Materials

- Student Guide
- Notebook paper (optional)
- Pens or pencils (optional)

Procedure

1. Have students read Chapter 10: Fishing for Answers. Introduce vocabulary terms as needed.

2. Assign the **Questions to Consider** as homework or use them in a cooperative learning activity.

1. How can knowledge of aquatic communities and food webs be used to improve fishing success?

Answers may include:

Use bait that looks or smells like a fish's natural food. Cast your line where you think fish are feeding. Fish may scour the bottom, hunt near the surface or swim anywhere between. Their need for cover attracts them to structures such as rocks, logs and plants. Fish use cover to escape predators and to help them ambush prey. Ask yourself, "If I were a fish, where could I hide from enemies and find food?"

2. How can knowledge of fish adaptations be used to improve fishing success?

Answers may include:

Bluegill have a small mouth because they eat small insects. Channel catfish are adapted to feed at night. They depend on barbels or "whiskers" with many taste buds and a good sense of smell to guide them to food even in dark, muddy waters. They can taste food even before taking it into their mouths. Largemouth bass are predators. Their large mouths enable them easily to catch frogs, fish, crayfish and other animals. The need for comfortable temperatures and oxygen levels keep fish moving. All fish are nearsighted, but the placement and shape of their eyes allows them to see almost all the way around their bodies. Fish have super hearing, especially for low-frequency sounds. Lateral lines let them sense water vibrations coming from each direction. "Keep quiet or you'll scare away the fish" is good advice when you're on a fishing trip.

3. How can knowledge of aquatic ecosystem types be used to improve fishing success?

Answers may include:

The edge of a lake's shoreline zone usually produces the most fish. In rivers, fish often feed where the flow changes direction or slows down. In flowing water, there is less current near the bottom. Because of this, most stream fish rest with their bellies almost touching the bottom. Most fish in a river face the flow of water and wait for food to come to them. Fish in current rarely move far for food. Young fish can find protection from larger fish and other predators by staying in the plant-filled shallow water of wetlands. Nutrients are available in the detritus in forms that small fish can use.

4. How can knowledge of weather be used to improve fishing success?

Answers may include:

Weather affects fish, but not always in predictable ways. Fish seem to prefer eating during the low-light conditions of morning and evening rather than in the bright sun of midday. Cloud cover mimics these low-light periods and may help get fish to bite. Fish are often near the surface in spring and early summer. Hotter weather sends fish deeper to find cooler temperatures such as in the open-water zone

of a lake. Warm fronts improve fishing, and the longer the front stays the better. Cold fronts often reduce fish movements. A light to moderate wind is better than no wind. Fish will move into shallower water to feed in windy conditions. Fishing is usually better where the wind blows into the shore than along protected shorelines. Fishing is good before and during a gentle rain but poor during and after a thunderstorm.

5. Why are rules about fishing limits and seasons important?

Answers may include:

These rules help Missourians share limited resources and keep our ecosystems healthy. Fishing season rules protect species by limiting the time of year during which they may be taken. Length limits give fish a chance to grow and spawn before people are allowed to catch and keep them. Number limits assure that no one takes too many. Rules about fishing limits and seasons can help us to make sure our aquatic ecosystems and other resources stay diverse, balanced and healthy far into the future.

6. What is an ethical angler? What are some rules of angling ethics?

Refer the section titled “Do the right thing” in the Student Guide

7. How can people help conserve Missouri’s aquatic ecosystems?

Answers may include:

To learn more about conserving Missouri’s aquatic resources, visit the Missouri Department of Conservation’s Web site. You can also visit your local Conservation Department office or a conservation nature center. Better yet, go outside and visit your favorite local aquatic resource. Begin thinking of it as YOUR lake, pond, river, stream, swamp or marsh. Always bring a trash bag when you visit, and take a moment to leave the spot in better shape than you found it. Start or join a Stream Team and adopt a water body (you’re not limited to streams). Learn more about checking water quality by taking a Stream Team Volunteer Water Quality Monitoring class. Volunteer to become a Master Naturalist. And if you’re up to the challenge, choose a career in conservation and make aquatic resources your life’s work. Above all, enjoy your aquatic resources and use them wisely!

Activity 10.5: Student Investigation of Missouri Fishing Regulations

This activity helps students understand Missouri fishing regulations.

Estimated Time

25 minutes

Required Materials

- 1 copy of Summary of Missouri Fishing Regulations booklet for each student
- 1 copy of the Scavenger Hunt for Missouri Fishing Regulations for each student
- Pens or pencils
- Prizes or rewards (optional)

Procedure

1. Ask the class why we have fishing regulations. (To help conserve and improve fish populations; to protect fish; to make sure there are enough fish to be shared by everyone.) Tell students that fishing is a fun sport, but that it is very important to know and follow fishing rules and regulations.
2. Distribute one copy of Summary of Missouri Fishing Regulations booklet and one copy of the Scavenger Hunt for Missouri Fishing Regulations to each student.
3. Discuss how the fishing regulations summary booklet is organized. Work through a few of the questions with the class to ensure that students understand how to find information in the book.
4. Tell the class that they are to use the Summary of Missouri Fishing Regulations booklet to find answers to questions on fishing regulations. (Optional) Explain to the class that the student or group with the highest points may receive a prize or reward.
5. Note: If your field trip is to a public impoundment, a river or stream, have students look up the special regulations for that area.
6. Score and discuss the answers in class.
7. (Optional) Award prizes to the winners.

SCAVENGER HUNT FOR MISSOURI FISHING REGULATIONS

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Objective

Find answers to questions on fishing regulations using the Summary of Missouri Fishing Regulations booklet.

Directions

Look under each heading in the Summary of Missouri Fishing Regulations booklet to find the answers to the questions or complete the statements listed below.

Permits General Information

1. At what age must you have a fishing permit? _____
2. Do you need a fishing permit to fish in a pond or lake completely located on your own property? _____
3. Does a Missouri resident who is permanently disabled and confined to a wheelchair need to purchase a fishing permit to be legal to fish? _____

Missouri Fishing Permits

1. How much does a resident fishing permit cost? _____
2. Does a resident fishing permit allow Missouri residents to catch frogs by fishing methods? _____
3. Who can buy a lifetime fishing permit? _____

Sport Fishing General Rules

1. Can a Missouri resident legally use explosives, poison, chemical or electrical equipment to kill fish? _____
2. Hooks on a trotline must be at least _____ feet apart.
3. Trotlines must be checked at least every _____ hours.

Jug Line Regulations

1. _____ jug lines must be personally attended at all times.

Game Fish

1. What is the length limit of a largemouth black bass caught from an Ozark stream? _____
2. When is the open season on a flathead catfish? _____
3. Is a walleye considered a game fish? _____
4. Name five Missouri game fish.
 1. _____
 2. _____
 3. _____
 4. _____
 5. _____

Nongame Fish

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Name five Missouri nongame fish.

1. _____
2. _____
3. _____
4. _____
5. _____

Trout Fishing Areas

Name four Missouri trout parks.

1. _____
2. _____
3. _____
4. _____

Do You Know the Fishes of Missouri?

Identify the following Missouri fish by the description given:

1. Long, pointed side fin, very small mouth, distinct ear flap without border or orange spot. _____
2. Upper jaw does not extend beyond back of the eye, two fins on back connected, very small cheek scales, side plain with a series of separate vertical bars. _____
3. The mouth is at tip of snout on bottom, slender-bodied, tail is forked, prominent cross bars on body

4. All endangered fish species must be returned unharmed immediately to the water. Name two of these species.
 1. _____
 2. _____

How to Measure a Fish (total length)

1. The total length of a catfish is measured from the _____ to the _____ with the mouth closed and the tail lobes pressed together.

Special Area Regulations

1. Do statewide regulations apply to large reservoirs, rivers and streams? _____
2. Most public fishing areas have methods, seasons, limits or other fishing regulations that are different from the statewide rules. How do you find out what the fishing regulations are for these areas?

3. What is the lake-wide length requirement for crappie in the Lake of the Ozarks? _____
4. What is the regulation for catching spotted bass in Blue Spring Creek? _____

Catch on to Catch-and-Release Fishing

Although practicing catch-and-release fishing is not always a regulation, the regulations booklet provides guidelines anglers can follow that will increase a fish's chances of survival. Name two of them.

1. _____
2. _____

SCAVENGER HUNT FOR MISSOURI FISHING REGULATIONS

Answer Key

Permits General Information

1. At what age must you have a fishing permit? **16–64 years of age**
2. Do you need a fishing permit to fish in a pond or lake completely located on your own property? **No**
3. Does a Missouri resident who is permanently disabled and confined to a wheelchair need to purchase a fishing permit to be legal to fish? **No**

Missouri Fishing Permits

1. How much does a resident fishing permit cost? **\$12**
2. Does a resident fishing permit allow Missouri residents to catch frogs by fishing methods? **Yes**
3. Who can buy a lifetime fishing permit? **Any Missouri resident**

Sport Fishing General Rules

1. Can a Missouri resident legally use explosives, poison, chemical or electrical equipment to kill fish? **No**
2. Hooks on a trotline must be at least **2** feet apart.
3. Trotlines must be checked at least every **24** hours.

Jug Line Regulations

1. **Unanchored** jug lines must be personally attended at all times.

Game Fish

1. What is the length limit of a largemouth black bass caught from an Ozark stream? **12-inch minimum**
2. When is the open season on a flathead catfish? **All year**
3. Is a walleye considered a game fish? **Yes**
4. Name five Missouri game fish.
Any five of the following: black bass (largemouth, smallmouth, spotted/Kentucky) catfish (channel, blue, flathead), crappie (black, white), muskellunge, northern pike, paddlefish, pickerel (chain, grass), rock bass, warmouth, shovelnose sturgeon, trout (rainbow, brown), walleye, sauger, white, yellow and striped bass

Nongame Fish

Name five Missouri nongame fish.

Any five of the following: bluegill, sunfish, carp, carpsuckers, suckers, buffalo, drum, gar, and those not listed as game fish or endangered

Trout Fishing Areas

Name four Missouri trout parks.

Maramec Spring Park, Bennett Spring State Park, Montauk State Park and Roaring River State Park

Do You Know the Fishes of Missouri?

Identify the following Missouri fish by the description given:

1. Long, pointed side fin, very small mouth, distinct ear flap without border or orange spot. **Bluegill**
2. Upper jaw does not extend beyond back of the eye, two fins on back connected, very small cheek scales, side plain with a series of separate vertical bars. **Smallmouth bass**
3. The mouth is at tip of snout on bottom, slender-bodied, tail is forked, prominent cross bars on body **Northern hog sucker**
4. All endangered fish species must be returned unharmed immediately to the water. Name two of these species.
Lake sturgeon and pallid sturgeon

How to Measure a Fish (total length)

1. The total length of a catfish is measured from the **tip of the snout** to the **end of the tail** with the mouth closed and the tail lobes pressed together.

Special Area Regulations

1. Do statewide regulations apply to large reservoirs, rivers and streams? **Yes, unless otherwise indicated in special regulations**
2. Most public fishing areas have methods, seasons, limits or other fishing regulations that are different from the statewide rules. How do you find out what the fishing regulations are for these areas? **They are posted at the areas and included in area brochures.**
3. What is the lake-wide length requirement for crappie in the Lake of the Ozarks? **15-inch minimum**
4. What is the regulation for catching spotted bass in Blue Spring Creek? **No minimum length limit**

Catch on to Catch-and-Release Fishing

Although practicing catch-and-release fishing is not always a regulation, the regulations booklet provides guidelines anglers can follow that will increase a fish's chances of survival. Name two of them.

Any two of the following:

- **Do not take fish out of water if possible.**
- **File barbs off hooks.**
- **Never pull a hook from the fish's throat or stomach; cut the line instead.**
- **Avoid excessive handling of the fish.**
- **Do not squeeze or drop the fish.**
- **Don't put your fingers in the fish's gills or eye sockets.**

Chapter 10 Assessment

Directions

Select the best answer for each of the following multiple-choice questions.

1. How do weather conditions affect fishing success?
 - a. Hot weather makes fish hungry.
 - b. Not always in easily predictable ways
 - c. Snow and ice guarantee fishing success.
 - d. Both a and b

2. Fish in flowing water tend to face:
 - a. Upstream
 - b. Downstream
 - c. Perpendicular to the current
 - d. No particular direction

3. The best time to fish is:
 - a. Mid-day
 - b. Morning and evening
 - c. When there is no wind blowing
 - d. From 2 to 4 p.m.

4. Aquatic resource conservation is:
 - a. Best left to professionals
 - b. Limited to certain times of the year
 - c. Unnecessary because Missouri has plenty of water
 - d. Everyone's responsibility

Apply your knowledge of these species' adaptations and their roles in the transfer of energy in Missouri aquatic food webs to predict the best bait or lure to use to catch:

5. Largemouth bass
 - a. Live minnow
 - b. Bare treble hook
 - c. Plastic worm dipped in stinkbait
 - d. Artificial fly that mimics a mayfly

6. Bluegill
 - a. Live minnow
 - b. Bare treble hook
 - c. Plastic worm dipped in stinkbait
 - d. Artificial fly that mimics a mayfly

7. Channel catfish
 - a. Live minnow
 - b. Bare treble hook
 - c. Plastic worm dipped in stinkbait
 - d. Artificial fly that mimics a mayfly

Apply your knowledge of these species' adaptations and habitat needs to predict where to find:

8. Largemouth bass
 - a. Shallow marsh
 - b. Below a riffle in weeds near a stream bank
 - c. Muddy bottom of a pond
 - d. Open water zone of a lake

9. Bluegill
 - a. Shallow marsh
 - b. Below a riffle in weeds near a stream bank
 - c. Muddy bottom of a pond
 - d. Open water zone of a lake

10. Channel catfish
 - a. Shallow marsh
 - b. Below a riffle in weeds near a stream bank
 - c. Muddy bottom of a pond
 - d. Open water zone of a lake

Chapter 10 Assessment

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Directions

Write your own answer for each of the following questions.

1. More effective fishing methods represent a technological solution to the problem of finding food. Predict how this could have both benefits and drawbacks such as risks or unintended consequences to aquatic ecosystems.
2. Justify the following statement: Fishing regulations, limits and seasons are among the best solutions to potentially harmful environmental changes within aquatic ecosystems in Missouri.
3. Apply your knowledge to recommend another solution to potentially harmful environmental changes within aquatic ecosystems in Missouri.

Chapter 10 Assessment Answer Key

Multiple-choice questions

1. How do weather conditions affect fishing success?
b. Not always in easily predictable ways
2. Fish in flowing water tend to face
a. Upstream
3. The best time to fish is
b. Morning and evening
4. Aquatic resource conservation is
d. Everyone's responsibility

Apply your knowledge of these species' adaptations and their roles in the transfer of energy in Missouri aquatic food webs to predict the best bait or lure to use to catch:

5. Largemouth bass
a. Live minnow
6. Bluegill
d. Artificial fly that mimics a mayfly
7. Channel catfish
c. Plastic worm dipped in stinkbait

Apply your knowledge of these species' adaptations and habitat needs to predict where to find:

8. Largemouth bass
d. Open water zone of a lake
9. Bluegill
b. Below a riffle in weeds near a stream bank
10. Channel catfish
c. Muddy bottom of a pond

Write-in questions

1. More effective fishing methods represent a technological solution to the problem of finding food. Predict how this could have both benefits and drawbacks such as risks or unintended consequences to aquatic ecosystems.

Answers may include:

Potential benefits:

More effective fishing methods could lead to easier to obtain, cheaper and more abundant food. This could provide better nutrition and greater health for humans. This could result in wealth accumulation and population growth. Less time and energy spent pursuing food could allow time and energy to be spent developing technology, art and culture.

Potential drawbacks:

More effective fishing methods could lead to over-exploitation of the resource, or over-fishing—taking out more fish than natural processes can replenish. Over-fishing could result in a decline in fish populations and destabilization of the ecosystem. Fish and other species in the aquatic community could decline or become extinct. Humans could exceed their carrying capacity in the region and also begin to decline.

2. Justify the following statement: Fishing regulations, limits and seasons are among the best solutions to potentially harmful environmental changes within aquatic ecosystems in Missouri.

Answers may include:

Fishing regulations, limits and seasons help Missourians share limited resources and keep our ecosystems healthy. Rules protect species by limiting the time of year during which they may be taken. Length limits give fish a chance to grow and spawn before people are allowed to catch and keep them. Number limits assure that no one takes too many. Missouri's rules are based on scientific data and research provided by fisheries biologists. The regulations, limits and seasons they prescribe can help us to make sure our aquatic ecosystems and other resources stay diverse, balanced and healthy far into the future. The greater the biodiversity in an ecosystem, the healthier, more sustainable and better balanced it is, and the more resilient it is to potentially harmful environmental changes.

3. Apply your knowledge to recommend another solution to potentially harmful environmental changes within aquatic ecosystems in Missouri.

Answers may include:

- **Always bring a trash bag when visiting aquatic resources, and take a moment to leave the spot in better shape than you found it.**
- **Avoid spilling and never dump any pollutants, such as gasoline or oil, into the aquatic environment.**
- **Be careful not to harm fish when doing catch-and-release fishing.**
- **Carefully handle and release alive all fish that are unwanted or not allowed, as well as other animals that may be caught accidentally.**
- **Choose a career in conservation and make aquatic resources your life's work.**
- **Follow rules of ethical conduct in the use of aquatic resources and teach others to do so, too.**
- **Get involved with nature—go outside and visit local aquatic resources.**
- **Join a Missouri Stream Team and help clean up a stream.**
- **Keep buffer zones of plant growth around water bodies.**
- **Keep no more fish than needed for eating, and never waste fish.**
- **Learn and obey angling and boating rules, and treat other anglers, boaters and property owners with courtesy and respect.**
- **Learn more about watershed conservation.**
- **Learn to check water quality.**
- **Practice good watershed management by stopping excess erosion and runoff loaded with fertilizers, pesticides or other pollutants.**
- **Put all trash, including used lines, leaders and hooks, in proper containers and help to keep fishing sites litter-free.**
- **Replenish fish populations by hatchery spawning and stocking.**
- **Respect property rights, and never go onto on private lands or waters without permission.**
- **Support enforcement of water laws and rules that penalize polluters.**
- **Take action to prevent the spread of invasive plants and animals, and never dump live bait into the water.**
- **Take part in conservation activities.**
- **Value and respect the aquatic environment and all living things in it.**
- **Visit a Conservation Department office or a conservation nature center.**
- **Volunteer to become a Master Naturalist.**
- **Work to pass legislation protecting aquatic ecosystems in Missouri.**
- **Work with Ducks Unlimited and other citizen conservation groups to protect and restore wetlands.**
- **Work with farmers, ranchers and other land users to help them prevent erosion, improve water quality, manage nutrients and protect and preserve wildlife habitat.**

Enrichments

Project WILD Aquatic:

- Living Research: Aquatic Heroes and Heroines
- Net Gain, Net Activity

Guest speaker:

- Missouri Department of Conservation outdoor skills specialist. If invited for activities, the speaker may be able to assist with instruction.
- Missouri Department of Conservation agent. If invited for activities, the speaker may be able to assist with instruction.

Video clips:

- Mississippi River Maintenance Man
- Missouri River Relief